REMARKS/ARGUMENTS

In response to the pending Office Action of June 29, 2005, Applicant presents the following arguments and amendments. The requested amendments are solely for the purpose of more clearly describing and claiming the present invention and do not introduce any new matter. Applicant submits that in light of the arguments presented and amendments requested, this application is in condition for allowance. Accordingly, entry of these amendments, reconsideration of all pending rejections and objections, and passage to allowance is respectfully requested. With the entry of this amendment claims 45, 46, 48-51, and 53-62 are pending herein.

Amendments to the Claims

Amendment to claim 45 is requested to more particularly point out and distinctly claim the present invention. Amended claim 45 incorporates the limitations claim 47 as originally presented. Support for the requested amendments is provided by claim 47 as originally presented, and by the description of an exemplary detector having a shield element comprising a "tubular shielding body (940) concentrically positioned about charge detection axis (140) and operationally connected to first endplate (950), second endplate (960), first shielding grid (970) and second shielding grid (980)" beginning on page 53, line 23 and ending on page 54, line 1. Support for the requested amendment to claim 45 is also provided by Figure 10. The requested amendment to claim 45 does not introduce any new matter.

Amendment of claims 48, 50, and 55-59 is requested to change their dependencies such that they now depend from amended claim 45, rather than depending from claim 47 (now cancelled). As claim 45 is now amended to include all the limitations from claim 47, support for the amendments is provided by claims 45 and 47 as originally presented. The requested amendments to claims 48, 50, and 55-59 do not introduce any new matter.

Amendment of claim 46 is requested to replace "shielding element" with the recitation "tubular shielding body." The requested amendment improves clarity and is supported by Figure 10 and the description of Figure 10 beginning on page 53, line 16 and ending on page 54, line 10. The requested amendment to claim 46 does not introduce any new matter.

New claim 61 is added to more particularly point out and distinctly claim the present invention. New claim 61 is direct to embodiments of the present invention wherein "said sensing electrode and said shielding element are not in electrical contact." Support for new claim 61 is provided by Figure 10 which shows sensing electrode (910) connected to shielding element (930) via insulators (920), and the corresponding description of Figure 10 beginning on page 53, line 16 to page 54, line New claim 61 does not introduce any new matter.

New claim 62 is added to more particularly point out and distinctly claim the present invention. New claim 62 is direct to embodiments of the present invention wherein "said charged particles pass along said detection axis through said first shield grid, the axial bore of said sensing electrode and said second shield grid." Support for new claim 62 is provided by the description on page 54 lines 17 – 19, which provides "[c]harged particles are conduced through fully shielded inductive detectors by sequentially passing through first shielding grid, the axial bore of the sensing electrode and the second shielding grid." New claim 62 does not introduce any new matter.

Rejections under 35 U.S.C. § 102

Claims 45 and 53-54 have been rejected under Section 102(b) as allegedly anticipated by "Inductive and capacitive sensor arrays for in situ composition sensors" by Steenberg *et al.* Aerospace Conference, 2001, IEEE Proceedings, 10-17 March 2001, Vol. 1 pages 1/299 – 1/309 (hereafter "Steenberg *et al.*"). The Examiner characterizes Steenberg *et al.* as teaching:

> a fully shielded inductive detector having a sensing electrode with an axial bore and shielding element with the sensing electrode located inside its axial bore (see Fig. 5(a)) . . . the shielding element is cylindrical (see Fig. 5(a)) . . . [and] the sensing electrode surrounded on all sides by the shielding element (see Fig. 5(a)).

In addition, claims 45 and 53 are rejected under U.S.C. 102(b) as being anticipated by "An instrument for Measuring Electric Charge on Individual Aerosol Particles" by Vercoulen *et al.*, J. Aerosol Sci., vol 22, suppl., pp S335-S338, 1991 (hereafter "Vercoulen *et al.*"). The Examiner characterizes Vercoulen *et al.* as teaching:

> a fully shield inductive detector having a sensing electrode with an axial bore and a shielding element with the sensing electrode located inside its axial bore (See, S337, para. 1-2)

Applicants respectfully disagree with the Examiner's characterization of Steenberg *et al.* and Vercoulen *et al.*. Amendment of the rejected claims is requested, however, to more particularly point out and distinctly claim the present invention, and Applicants request reconsideration and withdrawal of the rejections in light of the following arguments.

The rejected claims, as amended with this response, are directed to **fully shielded** inductive detectors having a structural configuration wherein a shielding element is provided that "entirely surrounds" the sensing electrode of the detector. Shielding elements are important components in the detectors of the present invention as they minimize electric charges induced on the sensing electrode by electric fields, magnetic fields, and electromagnetic fields from sources other than electrically charged particles undergoing detection and also ensure that charge is induced only when a charged particle undergoing detection is positioned proximate to the sensing electrode. (*See*, pg. 20, lines 5 – 7 & pg. 55, lines 14-16) Moreover, Applicants have discovered that this new fully shielded electrode configuration provides for: (i) flatter baseline signals, and

(ii) substantially more rapid transitions from baseline to peak and peak to baseline upon passage of a charge particle through the detector, as clearly shown by the data provided in Figures 11A-11C and corresponding description beginning on page 56, line 16 and ending on page 57, line 2. The present novel shielding configuration is central to providing this functionality, which results in fully shielded inductive detectors exhibiting enhanced detection sensitivities, and more accurate timing resolution relative to conventional partially shielded inductive detectors. (*See*, pg. 56, lines 1-8, 20-21 & 23- 24, and Equation VIII) This functional attribute of the present invention is also highly beneficial for mass spectrometry sensing applications as it enables detection of ions having low charge states and provides enhanced mass resolution for time-of-flight measurements. (*See*, pg. 56, lines 24 to pg. 57, line 2)

The structural limitation of the rejection claims "wherein said shielding element entirely surrounds said sensing electrode" is expressly defined on page 54, lines 12 – 14 of the specification and "means that the sensing electrode is surrounded on all sides by the shielding element". To clarify and emphasize this important aspect of the fully shielded inductive detectors of the present invention, however, Applicants respectfully request amendment of the rejected claims to specify a fully shielded detector geometry wherein the shielding element comprises "a tubular shielding body having said second axial bore, a first end and a second end, wherein said second axial bore is concentrically positioned about the detection axis; a first shielding grid positioned to intersect said detection axis and operationally connected to said first end of said shielding body, and a second shielding grid positioned to intersect said detection axis and operationally connected to said second end of said shielding body."

Although Steenberg *et al.* and Vercoulen *et al.* disclose inductive detectors and arrays of inductive detectors, the shielding configurations disclosed in these references do not include a shielding element that "entirely surrounds" the sensing electrode of the detector. Rather, the detector configurations disclosed

in these references are limited to partial shielded inductive detector configurations.

First, Steenberg *et al.* discloses sensor arrays using a segmented electrode to detect components embedded in a bulk material with different depths of penetration into the material. Although the configuration shown in Figure 5(a) of Steenberg *et al.* includes a shield element, the shield provided does not "entirely surround" the segmented electrode, as it does not surround the sensing electrode on all sides. Rather, the **partially shielded** detector geometry depicted in Figure 5(a) shows a single shield element that is positioned proximate to one side (the left side of Figure 5(a)) of the segmented electrode. In contrast to the fully shielded inductive detectors of the rejected claims, the configuration in Steenberg *et al.* does not shield the segmented electrode from electric fields, magnetic fields, and electromagnetic fields originating from all other directions, such as fields originating from the right side of Figure 5(a) or fields originating from directions above and below the plane containing the depicted external surfaces of sensing electrode. Furthermore, the sensor disclosed in Steenberg is not configured to detect and/or measure the electric charge of charged particles passing through the axial bore of a sensing electrode. Rather, the segmented electrode and the shield element of sensor arrays disclosed in Steenberg *et al.* are each non-cylindrical elements that **have no axial bore**. Accordingly, Applicants submit that this reference does not anticipate claims 45 and 53-54 because Steenberg *et al.* fails to disclose, enable or even suggest: (i) a shield element that entirely surrounds the sensing electrode, (ii) a sensing electrode having a first axial bore positioned about a detection axis" and (iii) "a shield element having a second axial bore concentrically positioned along the detection axis." Rapoport v. Dement, 254 F.3d 1053, 1057, 59 USPQ2d 1423 (Fed. Cir. 2001) (" To anticipate a claim, a prior art reference must disclose every limitation of the claimed invention"). Reconsideration and withdrawal of the pending rejections under 35 U.S.C. Section 102 is respectfully requested.

Second, Vercoulen *et al.* discloses a detector for detecting charged particles passing through the center of a ring-shaped sensing electrode. Although the configuration described by of Vercoulen *et al.* includes an "outer ring" that "acts as a guard", this concentric ring shielding geometry does not entirely surround the ring-shaped sensing electrode, as it does not surround the sensing electrode on all sides. Specifically, the **partially shielded** electrode geometry disclosed in this reference does not provide shielding for the front side (i.e. particle entrance) and back side (i.e. particle exit) of the ring-shaped sensing electrode and, thus, no shielding is provided for electric fields, magnetic fields, and electromagnetic fields originating from directions parallel to the path of the charged particles undergoing detection. In contrast, fully shielded inductive detectors of the rejected claims are provided with first and second shielding grids positioned to intersect the detection axis, which provide shielding for the entrance and exit of the sensing electrode. Accordingly, Applicants submit that this reference does not anticipate claims 45 and 53 because Vercoulen *et al.* fails to disclose, enable or even suggest: (i) a shield element that entirely surrounds the sensing electrode, (ii) a first shielding grid positioned to intersect said detection axis, and (iii) a second shielding grid positioned to intersect said detection axis; Rapoport v. Dement, 254 F.3d 1053, 1057, 59 USPQ2d 1423 (Fed. Cir. 2001) ("To anticipate a claim, a prior art reference must disclose every limitation of the claimed invention"). Reconsideration and withdrawal of the pending rejections under 35 U.S.C. Section 102 is respectfully requested.

Rejections under 35 U.S.C. § 103

Claims 45-60 are rejected under Section 103(a) as allegedly unpatentable over U.S. Patent No. 5,591,696 (hereafter Park *et al.*). With respect to these pending rejections, the Examiner asserts:

> Park et al teach an inductive detector having a sensing electrode (40) with an axial bore, internal end and external end (see fig. 2) [and] . . . shielding element. Park et al. does not explicitly teach a shield element having an axial bore wherein the sensing electrode is positioned . . . [h]owever, Park et al. suggest the possibility that the shielding element have a cylindrical shape (see, col. 6, lines 28-34). Park also teach the adaptability of the shielding elements to different shapes, wherein the size and shape of the elements fall with in the level of ordinary skill in the art (see col. 7, lines 11-20).

In support of the rejection, the Examiner concludes:

> Park et al.'s disclosure make obvious the claimed invention, because an ordinary artisan at the time of the invention could logically envisage a cylindrical shielding element surrounding the sensing electrode (40) after a fair reading of Park et al.

Applicants respectfully traverse these rejections. Amendment of the rejected claims is requested, however, to more clearly specify the claimed invention. Accordingly, Applicants request reconsideration and withdrawal of the rejections in light of the following arguments.

Park *et al.* do not disclose sensors having a fully shield configuration wherein the shield element "entirely surrounds" the sensing electrode because the sensing electrode in Park *et al.* is not surrounded on all sides by the shielding element (See, definition of "entirely surrounds" provided on page 54, lines 11 – 14). Rather, Park *et al.* is limited to **partially shielded** electrode geometries having first and second shielding grids (elements 24 & 26) that providing shielding only along the charge particle flight path (element 16). The sensing electrode in Park *et al.*, therefore, is not shielded on any side other than the front (i.e. particle entrance) and back (i.e. particle exit) with respect to the flight path of the particles undergoing detection. As discussed above, the distinction between partially shielded and fully shielded inductive detectors is highly material, as the Applicants believe that they are the first to discover the significant functional benefits, including increased sensitivity, enhanced temporal resolution and enhanced mass resolution, enabled using a fully shielded detector configuration.

(*See*, Figures 11A-11C, and description beginning on line 1, page 56 and ending on line 2, page 57). Claims 45-60 are not rendered obvious by the cited reference because Park *et al.* fails to teach, enable or suggest all the limitations in the amended claims, namely a shield element that entirely surrounds the sensing electrode, and these missing claim limitations are well outside the grasped of the typical artisan at the time of invention. *See, e.g.*, In re Royka, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). It is therefore submitted that no *prima facie* case of obviousness has been made out with respect to this rejection, and reconsideration and withdrawal thereof is respectfully requested.

Applicants disagree with the Examiner's assertion that an ordinary artisan at the time of the invention could logically envisage a cylindrical shielding element surrounding the sensing electrode after a fair reading of Park *et al.* Shielding elements for "entirely shielding" the sensing electrode set forth in the rejected claims, as amended with this response, comprise a combination of three separate (but operationally connected) elements: (1) a tubular shielding body having an axial bore wherein the sensing electrode is positioned, (2) a first shielding grid positioned to intersect said detection axis and operationally connected to the first end of the shielding body, and (3) a second shielding grid positioned to intersect the detection axis and operationally connected to the second end of the shielding body. The teaching in Park *et al.*, in contrast to the present invention, is limited in scope to partially shielded electrode configurations not having a tubular shielding body for housing the sensing electrode. Contrary to the Examiner's assertions, Applicants submit that an ordinary artisan at the time of the invention would not have arrived at the invention as claimed by merely modifying the shape of either first or second shielding grid so as to arrive at a tubular shielding body for housing the sensing electrode. Rather, an ordinary artisan would need to effectively integrate this entirely new and separate device component into the configuration of Park *et al.*, and applicants note that nowhere in Park *et al.* is there any suggestion or motivation to combine the first and second shielding grids with an additional shielding device component, let

alone to arrive at the specific combination claimed including a tubular shielding body having an axial bore concentrically positioned about the detection axis.

The teaching in Park *et al.* relating to device components having a cylindrical shape on col. 6, lines 28-34 (and in Fig. 2 referenced therein) is limited to "the detector grid component serving as the sensor electrode" (element 22). This element in Park *et al.* corresponds to the sensing electrode of the present invention, and **does not** correspond to the shield elements. Moreover, Park *et al.* does not provide any teaching, suggestion or motivation for the specific configuration claimed wherein the tubular shielding element is positioned in a manner so as to house the sensing electrode with its axial bore and to having first and second shielding grids operationally connect to its first and second ends. As amended with this response, claims 45 - 60 are not rendered obvious by the cited reference because Park *et al.* fails to teach, enable or suggest all the limitations in the amended claims, namely a tubular shielding body having an axial bore positioned such that the sensing electrode is with the axial bore of the tubular shielding body and having first and second ends connected to first and second shielding grids, respectively, and these missing claim limitations are well outside the grasped of the typical artisan at the time of invention. *See, e.g.*, In re Royka, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). It is therefore submitted that no *prima facie* case of nonobviousness has been made out with respect to this rejection, and reconsideration and withdrawal thereof is respectfully requested.

CONCLUSION

In view of the foregoing arguments, this case is considered to be in condition for allowance and passage to issuance is respectfully requested. If new issues of patentability are raised, the Examiner is invited to call and arrange for an opportunity to discuss these issues via phone interview.

It is believed that no fee is required with this submission. If this is incorrect, however, please deduct the appropriate fees for this submission along with any extension of time required from Deposit Account No. 07-1969.

Respectfully submitted,

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